Question 1:

- When a woman marries her butler, GDP falls by the amount of the butler's salary. This happens because measured total income, and therefore measured GDP, falls by the amount of the butler's loss in salary.
- If GDP truly measured the value of all goods and services, then the marriage would not affect GDP since the total amount of economic activity is unchanged.
- Actual GDP, however, is an imperfect measure of economic activity because the value of some goods and services is left out.
- Once the butler's work becomes part of his household chores, his services are no longer counted in GDP.
- This example illustrates, GDP does not include the value of any output produced in the home. Similarly, GDP does not include other goods and services, such as imputed rent on durable goods and any illegal trade.

ASIDE:

$$\text{Nominal GDP}_t = \sum_{i=1}^{n} P_{i,t} Q_{i,t} \qquad \text{Real GDP}_t = \sum_{i=1}^{n} P_{i,\text{Base-year}} Q_{i,t}$$

$$\text{GDP Deflator}_t = \frac{\text{Nominal GDP}_t}{\text{Real GDP}_t} \times 100$$

$$\text{CPI}_t = \left(\frac{\text{Cost of Basket}_t}{\text{Cost of Basket}_{\text{Base year}}} \right) \times 100, \text{ where } \text{Cost of Basket}_t = \sum_{i=1}^{n} P_{i,t} Q_{i,\text{Base-year}}$$

Question 2:

Part(a)

GDP measures the value of the final goods and services produced, which is $1,000,000 for lawn mowing in this case.

Part(b)

NNP is equal to GNP minus depreciation. There are no factor payments to or from abroad here, so GNP is equal to GDP. Then, since depreciation is $125,000, NNP is $875,000.

Part (c)

National income is equal to NNP, or $875,000.

Part (d)

Compensation of employees is $600,000.

Part (e)

Proprietors' income measures the income of the owner, which is $150,000 of dividends here.

Part (f)
Corporate profits are equal to the sum of corporate taxes, dividends, and retained earnings. Here corporate profits are \$50,000 + \$150,000 + \$75,000 = \$275,000.

Part (g)
Personal income is equal to employee compensation plus dividends, or \$750,000.

Part (h)
Disposable personal income is personal income minus personal taxes, or \$550,000.

Question 3:
Part (a)

i. Nominal GDP is the total value of goods and services measured at current prices. Therefore,

$$\text{Nominal GDP}_{2010} = \left(P^{2010}_{\text{hot dogs}} \times Q^{2010}_{\text{hot dogs}}\right) + \left(P^{2010}_{\text{burgers}} \times Q^{2010}_{\text{burgers}}\right)$$
$$= (\$2 \times 200) + (\$3 \times 200)$$
$$= \$400 + \$600$$
$$= \$1{,}000.$$

$$\text{Nominal GDP}_{2018} = \left(P^{2018}_{\text{hot dogs}} \times Q^{2018}_{\text{hot dogs}}\right) + \left(P^{2018}_{\text{burgers}} \times Q^{2018}_{\text{burgers}}\right)$$
$$= (\$4 \times 250) + (\$4 \times 500)$$
$$= \$1{,}000 + \$2{,}000$$
$$= \$3{,}000.$$

ii. Real GDP is the total value of goods and services measured at base-year prices. In the base year (2010), real GDP is equal to nominal GDP, so real GDP in 2010 is \$1,000. To calculate real GDP in 2018, multiply the quantities purchased in 2018 by the 2010 prices:

$$\text{Real GDP}_{2018} = \left(P^{2010}_{\text{hot dogs}} \times Q^{2018}_{\text{hot dogs}}\right) + \left(P^{2010}_{\text{burgers}} \times Q^{2018}_{\text{burgers}}\right)$$
$$= (\$2 \times 250) + (\$3 \times 500)$$
$$= \$500 + \$1{,}500$$
$$= \$2{,}000.$$

iii. The implicit price deflator for GDP is the ratio of nominal to real GDP. In the base year (2010), it is equal to 1. In 2018, we have:

$$\text{GDP Deflator}_{2018} = \frac{\$3{,}000}{\$2{,}000} = 1.5.$$

iv. The CPI uses a fixed basket of goods to measure changes in the price level over time. In the base year (2010), it is equal to 1. The CPI for 2018 measures the cost of the 2010 basket of goods in 2018 relative to the cost in 2010:

$$\begin{aligned}
\text{CPI}_{2018} &= \frac{(P^{2018}_{\text{hot dogs}} \times Q^{2010}_{\text{hot dogs}}) + (P^{2018}_{\text{burgers}} \times Q^{2010}_{\text{burgers}})}{(P^{2010}_{\text{hot dogs}} \times Q^{2010}_{\text{hot dogs}}) + (P^{2010}_{\text{burgers}} \times Q^{2010}_{\text{burgers}})} \\
&= \frac{(\$4 \times 200) \ + \ (\$4 \times 200)}{(\$2 \times 200) \ + \ (\$3 \times 200)} \\
&= \frac{\$1{,}600}{\$1{,}000} \\
&= 1.6.
\end{aligned}$$

Part (b)
The GDP deflator is a Paasche index because it has a changing basket of goods, while the CPI is a Laspeyres index because it has a fixed basket of goods. The GDP deflator for 2018 is 1.5, which indicates that prices rose by 50 percent from their 2010 levels. The CPI for 2018 is 1.6, which indicates that prices rose by 60 percent from their 2010 levels.

If the prices of all goods rose by, for example, 50 percent, then one could say unambiguously that the price level rose by 50 percent. In our example, however, relative prices changed. The price of hot dogs rose by 100 percent, while the price of hamburgers rose by 33.33 percent, making hamburgers relatively less expensive. Consumers responded by increasing the quantity of hamburgers purchased relative to the quantity of hot dogs purchased. Since the CPI has a fixed basket of goods, it does not take into account this substitution effect and therefore gives a higher inflation rate than the GDP deflator.

Question 4:
Part (a)
To calculate the CPI, we fix the basket of goods in year 1 and allow prices to change over time. In the base year the CPI is 1, and in year 2 it is

$$\begin{aligned}
\text{CPI}_2 &= \frac{\left(P^2_{\text{red}} \times Q^1_{\text{red}}\right) + \left(P^2_{\text{green}} \times Q^1_{\text{green}}\right)}{\left(P^1_{\text{red}} \times Q^1_{\text{red}}\right) + \left(P^1_{\text{green}} \times Q^1_{\text{green}}\right)} \\
&= \frac{\left(\$2 \times 10\right) + \left(\$1 \times 0\right)}{\left(\$1 \times 10\right) + \left(\$2 \times 0\right)} \\
&= 2.
\end{aligned}$$

According to the CPI, prices have doubled.

- Cost of basket$_1$ = (\$1 × 10) + (\$2 × 0) = \$10.
- Cost of basker$_2$ = (\$2 × 10) + (\$1 × 0) = \$20
- $\text{CPI}_2 = \frac{(\$2 \times 10) + (\$1 \times 0)}{(\$1 \times 10) + (\$2 \times 0)} \times 100 = 200$. Prices have double.

Part (b)
In both years, Abby buys 10 apples for \$1 each, so her nominal spending is \$10.

- Nominal spending in year 2 = ($2 × 0) + ($1 × 10) = $10.
- There is no change in nominal spending.

Part (b)
In year 1, the base year, Abby's real spending equals her nominal spending of $10. In year 2, she consumes 10 green apples that are each valued at their year 1 price of $2, so her real spending is $20. That is,

$$\begin{aligned}\text{Real Spending}_2 &= \left(P^1_{\text{red}} \times Q^2_{\text{red}}\right) + \left(P^1_{\text{green}} \times Q^2_{\text{green}}\right) \\ &= (\$1 \times 0) + (\$2 \times 10) \\ &= \$20.\end{aligned}$$

- Real spending in year 2 = ($1 × 0) + ($2 × 10) = $20.
- Her real spending increases from $10 to $20.

Abby's real spending doubles from $10 to $20.

Part (d)
The implicit price deflator is calculated by dividing Abby's nominal spending in year 2 by her real spending that year, so it is equal to 1 in the base year (year 1) and in year 2 is equal to

$$\begin{aligned}\text{Implicit Price Deflator}_2 &= \frac{\text{Nominal Spending}_2}{\text{Real Spending}_2} \\ &= \frac{\$10}{\$20} \\ &= 0.5.\end{aligned}$$

The implicit price deflator suggests that prices have fallen by half. The reason for this is that the deflator estimates how much Abby values her apples using prices prevailing in year 1. From this perspective, green apples appear more valuable. In year 2, when Abby consumes 10 green apples, it appears that her consumption has increased because the deflator values green apples more highly than red apples. The only way Abby could still be spending $10 on a higher (i.e. better) consumption bundle is if the price of the good she was consuming fell.

Part (e)
If Abby thinks of red apples and green apples as perfect substitutes, then the cost of living in this economy has not changed—in either year it costs $10 to consume 10 apples. The CPI, a Laspeyres price index, indicates that the cost of living doubled, while the implicit price deflator, a Paasche price index, indicates that the cost of living was cut in half. This is because the CPI ignores the fall in price of green apples because they were not in the consumption bundle in year 1. In contrast to the CPI, a Laspeyres index that overstates the increase in the cost of living, the deflator, a Paasche index, understates it.

This is because the CPI fails to take into account the changing basket of goods, and the

implicit price deflator fails to take into account the changing relative price. This suggests that a combination of the two indexes, such as a chain-weighted index, would be a better measure of the true cost of living.

Question 5

- It may not be a good sign to the economy because the fall in unemployment rate could be caused by ***discouraged workers*** (those unemployed workers who are no longer looking for jobs and leave the labour force).
- Given these discouraged workers are no longer counted as unemployed, the number of unemployed falls and so does the unemployment rate.